

AD-A143 687

DROUGHT CONTINGENCY PLAN BLACK ROCK LAKE THOMASTON  
CONNECTICUT; HOUSATONIC RIVER BASIN NAUGATUCK RIVER  
WATERSHED(U) CORPS OF ENGINEERS WALTHAM MA NEW ENGLAND

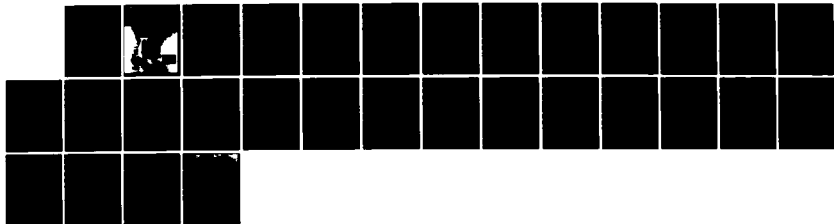
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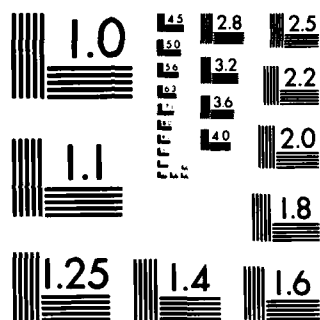
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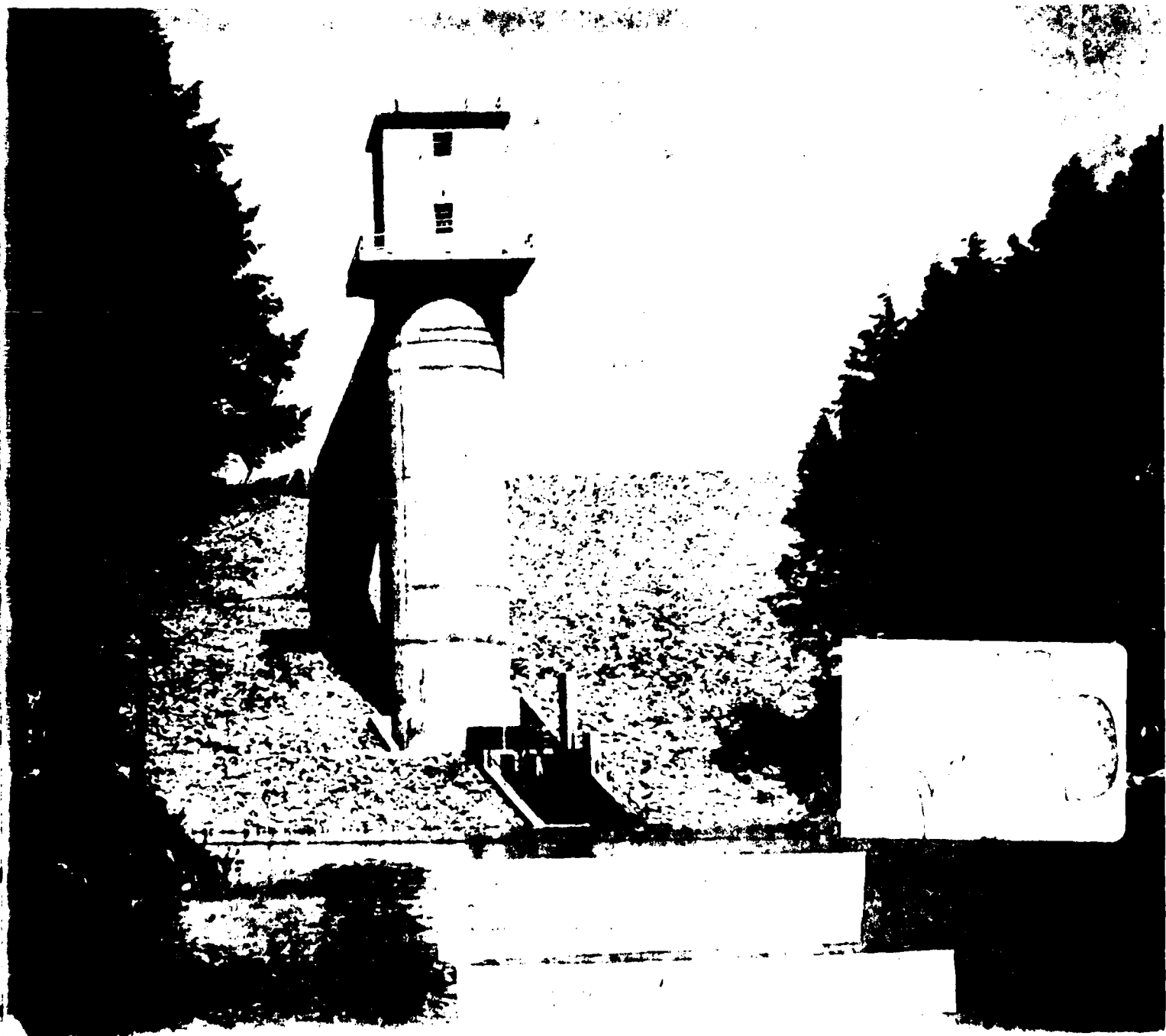
August 1983

# Drought Contingency Plan

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Black Rock Lake, Thomaston, Connecticut

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|---|-----------------------|--|
| 1. REPORT NUMBER  | 2. GOVT ACCESSION NO. | 3. RECIPIENT'S CATALOG NUMBER                                  |
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| 20. ABSTRACT (Continue on reverse side if necessary and identify by block number)<br>Report develops and sets forth a possible drought contingency plan of operation for Black Rock Lake that would be responsive to public needs during drought periods. Scope of plan includes description of existing water supply, conditions, reservoir storage, water quality evaluation, impacts on other projects and conclusions. This site can provide a maximum water supply reserve of about 500 acre-feet (163 million gallons). |                       |  |

HOUSATONIC RIVER BASIN  
NAUGATUCK RIVER WATERSHED

DROUGHT CONTINGENCY PLAN  
BLACK ROCK LAKE  
THOMASTON, CONNECTICUT

AUGUST 1983

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DROUGHT CONTINGENCY PLAN

BLACK ROCK LAKE

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DROUGHT CONTINGENCY PLAN  
BLACK ROCK LAKE

1. PURPOSE AND SCOPE

The purpose of this study and report was to develop and set forth a possible drought contingency plan of operation for Black Rock Lake that would be responsive to public needs during drought periods and identify possible modifications to project regulation within current administration and legislative constraints. The scope of this drought contingency plan includes a description of existing water supply conditions, the possibility of reservoir storage within specified limits, water quality evaluation, discussion of impacts on other project purposes, and summary and conclusions.

2. AUTHORIZATION

Authority for the preparation of drought contingency plans is contained in ER 1110-2-1941 which provides that water control managers will continually review and, when appropriate, adjust water control plans in response to changing public needs. Drought contingency plans will be developed on a regional, basinwide and project basis as an integral part of water control management activities.

3. PROJECT AUTHORIZATION CONDITIONS

Black Rock Lake was authorized by the Flood Control Act approved 14 July 1960, Public Law 86-645, 86th Congress, 2d session substantially in accordance with the recommendations of the Chief of Engineers in House Document 372. This lake has been authorized as a flood control project which includes a permanent conservation pool. Authorization for development and use of the lake area for public recreation and other purposes is contained in section 4 of the Flood Control Act approved 22 December 1944, as amended.

4. PROJECT DESCRIPTION

Black Rock Lake is located in Thomaston and Watertown, Connecticut on Branch Brook, about 2 miles upstream from its confluence with the Naugatuck River (see plate 1).

The lake contains storage for flood control and recreation. The recreation pool at elevation 437 feet NGVD (27-foot stage) contains 305 acre-feet, equal to 0.3 inch of runoff. The flood control storage contains 8,450 acre-feet (2.8 billion gallons) equivalent to 7.8 inches of runoff from the 20.4-square mile drainage area. An area capacity table is shown on plate 2.

Components of the project consist of a rolled earth fill and rock-faced dam, outlet works and a chute spillway. The outlet works are located on the right bank and consist of an intake channel, a concrete weir to maintain a permanent pool, a control tower on the upstream side of the dam, a 704-foot long x 4-foot wide x 5-foot high rectangular conduit, and an outlet channel. The lower part of the control tower contains the gate chamber with two 3 x 4-foot high slide gates at invert elevation 410 feet NGVD. The intake channel weir is located justupstream of gate 1. The 5 stoplog openings of the control weir are 4 feet deep for flexibility in maintaining the level of the permanent pool.

Three water supply reservoirs, owned and operated by the city of Waterbury, Connecticut, located on Branch Brook upstream of Black Rock Lake, are Pitch, Morris and Wigwam.

## 5. PRESENT OPERATING REGULATIONS

a. Normal Periods. During the nonfreezing season, a small permanent pool approximately 27 feet deep upstream of gate 1, is maintained by a concrete weir and stoplog structure. This gate is set at a 3-foot opening while gate 2 is set at 0.1 foot. This setting also restricts discharges during unexpected flood conditions, and prevents the loss of fish population while maintaining flow from the top and bottom of the pool. Drawing from the top and bottom constantly mixes the outflow, improving the quality of both the pool and discharge. The pool stage can be maintained between 23 and 27 feet with the use of stoplogs. During the winter, the conservation pool will be maintained at an approximate stage of 27 feet.

b. Flood Periods. The Black Rock project is operated in concert with other projects in the basin to reduce flooding in the downstream Naugatuck River. Operation for floods may be

considered in three phases: Phase I - appraisal of storm and river conditions during development of a flood, Phase II - flow regulation and storage of flood runoff at the reservoir, and Phase III - emptying the reservoir during recession of the flood.

c. Operating Constraints

(1) Minimum Releases. A minimum release of 10 to 20 cfs (6.5 to 13 mgd) is maintained during periods of flood regulation in order to sustain downstream fish life.

(2) Maximum Releases. The maximum nondamaging discharge capacity immediately downstream of Black Rock Lake is about 800 cfs. Releases at or near this rate can be expected whenever peak inflows have exceeded this value and meteorological and hydrologic conditions permit such releases.

6. DESCRIPTION OF EXISTING WATER SUPPLY CONDITIONS

a. General. The following section presents information concerning the existing water supply systems in western and northwestern Connecticut which include Litchfield County in its entirety and portions of Hartford, Middlesex, and New Haven Counties. Tables 1 and 2 contain information about public water suppliers in the area which serve a population greater than 1,000 and projected populations through the year 2030. The tables have been formulated using data primarily provided by the State of Connecticut Department of Environmental Protection, supplemented with information from the Housatonic River Basin Urban Study, published by the Corps of Engineers in September 1982. Data provided by the State for the major water suppliers include a computer printout of water utility records for 1980, a summary of surface water sources in the study area, and information on ground water sources where available. In those instances where data provided by the State was incomplete, information from the Corps Housatonic River Study was used. Remainder of the missing information was not developed as such efforts were considered beyond the level of detail required for this study.

b. Water Supply Systems. The primary objective of this analysis was to accumulate available data regarding water supply

systems in the vicinity of Black Rock Lake that could benefit from storage in the lake and present it in a manner portraying existing water supply conditions. Projections of future demands were not developed as this study only addresses the effects of drought conditions which may occur at any time in the future. Modifications in the operational procedures at Black Rock Lake would provide storage for water supply purposes only when drought conditions exist and not to meet normal water supply demands at some future date.

c. Western Connecticut Water Suppliers. Information pertaining to the larger water suppliers in western Connecticut are presented in table 1. Data for each supplier includes: the communities served, estimated population served within each community, source of supply (ground or surface), water production in million gallons during 1980, and the estimated safe yield of each source. An analysis as to whether existing sources can provide adequate supplies during drought conditions was not performed. The information has been accumulated to present a summary of the existing water conditions pertaining to major water suppliers in western and northwestern Connecticut.

d. Population Projections. Population projections in table 2 for communities in western and northwestern Connecticut, show the population in each community potentially affected by a prolonged dry period. This data was taken from Population Projections for Connecticut Municipalities and Regions to the year 2000, published by the State of Connecticut Office of Policy and Management. This information is presented to indicate potential future growth in western Connecticut.

## 7. POTENTIAL FOR WATER SUPPLY REALLOCATION

a. General. According to provisions contained in the Water Supply Act of 1958 (Public Law 500, 85th Congress, Title III), as amended, municipal and industrial water supply storage space may be recommended for inclusion in Corps of Engineers reservoirs.

The law provides that up to 15 percent of total storage capacity allocated to all authorized Federal purposes or 50,000 acre-feet (16 billion gallons) whichever is less, may be allocated from the

## MAJOR WATER SUPPLY

| Company                                | Towns Served  | Est. Population Served  | Source |
|--|---|---|--------|
| Avon Water Co.                         | Avon<br>Simsbury  | 5720<br>220   |        |
| Berlin Water Control Comm.             | Berlin  | 2248  |        |
| Bristol Water Co.                      | Bristol<br>Burlington   | 51450<br>45   | x      |
| Collinsville Division<br>CT. Water Co. | Avon<br>Burlington<br>Canton  | 473<br>137<br>2418  |        |
| Cromwell Fire Dist. Water Div.         | Cromwell  | 9000  |        |
| Farmington Water Co. Main Sys.         | Farmington  | 3000  |        |
| Farmington Woods Water Co.             | Avon<br>Farmington  | 875<br>375  |        |
| Heritage Village Water Co.             | Middlebury<br>Oxford<br>Southbury   | 25<br>50<br>5500  |        |
| Indian Hill WC, Ind. Field Co.         | Naugatuck   | 1398  |        |
| Kensington Fire Dist.                  | Berlin  | 9000  |        |
| Lakeville Div., Litch Co. WC           | Salisbury   | 3199  |        |
| Litchfield Div., Litch Co. WC          | Litchfield  | 2576  |        |
| Meriden Water Dept.                    | Meriden   | 57118   | x      |
| Met. Dist. Water Bureau                | Bloomfield<br>E. Hartford<br>Farmington<br>Glastonbury<br>Hartford<br>Manchester<br>Newington<br>Rocky Hill<br>S. Windsor<br>W. Hartford<br>Wethersfield<br>Windsor | 18595<br>52554<br>650<br>14200<br>136319<br>1000<br>28839<br>14559<br>3300<br>61301<br>26013<br>25171 | x      |
| Middletown Water Dept.                 | Middletown  | 35000   | x      |

TABLE 1  
MAJOR WATER SUPPLIERS - WESTERN AND NORTHWESTERN CONNECTICUT

| Population<br>Served | Source of Supply |        | Water Production<br>1980 - MG |                    | Est. Safe Yield<br>MGD |                    |            |
|----------------------|------------------|--------|-------------------------------|--------------------|------------------------|--------------------|------------|
|                      | Surface<br>1980  | Ground | Surface                       | Ground             | Surface                | Ground<br>(Active) | (Inactive) |
| 5720                 |                  |        |                               |                    |                        |                    |            |
| 220                  |                  | x      |                               | 208.8              |                        | .988               |            |
| 2248                 |                  | x      |                               | 208.5              |                        | .837               |            |
| 450                  |                  |        |                               |                    |                        |                    |            |
| 45                   | x                | x      | 2216.2                        | 635.2              | 3.900                  | 2.050              |            |
| 473                  |                  |        |                               |                    |                        |                    |            |
| 137                  |                  |        |                               |                    |                        |                    |            |
| 418                  |                  | x      |                               | .8                 |                        | -                  |            |
| 000                  |                  | x      |                               | 315.5              |                        | 1.296              | .619       |
| 000                  |                  |        |                               |                    |                        |                    |            |
| 875                  |                  |        |                               |                    |                        |                    |            |
| 375                  |                  | x      |                               | 63.3               |                        | .027               |            |
| 25                   |                  |        |                               |                    |                        |                    |            |
| 50                   |                  |        |                               |                    |                        |                    |            |
| 500                  |                  | x      |                               | 352.7              |                        | .902               | .621       |
| 398                  |                  | x      |                               | -                  |                        | .346               |            |
| 000                  |                  | x      |                               | -                  |                        | -                  |            |
| 199                  |                  | x      |                               | 124.1 <sup>1</sup> |                        | .756               | .864       |
| 576                  |                  | x      |                               | 94.9               |                        | .345               | .017       |
| 118                  | x                | x      | 1818.1                        | 738.9              | 5.200                  | 2.370              | 3.350      |
| 595                  |                  |        |                               |                    |                        |                    |            |
| 554                  |                  |        |                               |                    |                        |                    |            |
| 550                  |                  |        |                               |                    |                        |                    |            |
| 200                  |                  |        |                               |                    |                        |                    |            |
| 319                  |                  |        |                               |                    |                        |                    |            |
| 000                  |                  |        |                               |                    |                        |                    |            |
| 339                  |                  |        |                               |                    |                        |                    |            |
| 559                  |                  |        |                               |                    |                        |                    |            |
| 000                  |                  |        |                               |                    |                        |                    |            |
| 001                  |                  |        |                               |                    |                        |                    |            |
| 013                  |                  |        |                               |                    |                        |                    |            |
| 71                   | x                |        | 20972.0                       |                    | 43.000                 |                    |            |
| 000                  | x                | x      | 830.9                         | 837.4              | 2.230                  | 4.260              | 1.340      |

2

TABLE 1  
 ERN AND NORTHWESTERN CONNECTICUT

| Water Production<br>1980 - MG |                    | Est. Safe Yield<br>MGD |                    |            | Water<br>Purchased<br>MG |
|-------------------------------|--------------------|------------------------|--------------------|------------|--------------------------|
| Surface                       | Ground             | Surface                | Ground<br>(Active) | (Inactive) |                          |
|                               | 208.8              |                        | .988               |            |                          |
|                               | 208.5              |                        | .837               |            | 95.0                     |
| 2216.2                        | 635.2              | 3.900                  | 2.050              |            |                          |
|                               | .8                 |                        | -                  |            | 96.0                     |
|                               | 315.5              |                        | 1.296              | .619       |                          |
|                               |                    |                        |                    |            | 147.0                    |
|                               | 63.3               |                        | .027               |            |                          |
|                               | 352.7              |                        | .902               | .621       |                          |
|                               | -                  |                        | .346               |            |                          |
|                               | -                  |                        | -                  |            |                          |
|                               | 124.1 <sup>1</sup> |                        | .756               | .864       |                          |
|                               | 94.9               |                        | .345               | .017       |                          |
| 1818.1                        | 738.9              | 5.200                  | 2.370              | 3.350      |                          |
| 1972.0                        |                    | 43.000                 |                    |            |                          |
| 830.9                         | 837.4              | 2.230                  | 4.260              | 1.340      |                          |

2

3

TABLE  
MAJOR WATER SUPPLIERS -

| Company                        | Towns Served  | Est. Population Served | Source of Surface Ground Water 1980 |   |
|--------------------------------|---------------|------------------------|-------------------------------------|---|
| Naugatuck Div. CT. Water Co.   | Beacon Falls  | 200                    |                                     |   |
|                                | Naugatuck     | 18851                  |                                     |   |
|                                | Waterbury     | 315                    | x                                   | x |
| New Britain Water Dept.        | Berlin        | 180                    |                                     |   |
|                                | Farmington    | 495                    |                                     |   |
|                                | New Britain   | 73840                  |                                     |   |
|                                | Newington     | 800                    |                                     |   |
|                                | Plainville    | 50                     | x                                   |   |
| New Hartford Water Dept.       | New Hartford  | 1068                   |                                     |   |
| New Milford Water Co.          | New Milford   | 5300                   | x                                   | x |
| North Canaan Div. Litch Co. WC | N. Canaan     | 1687                   |                                     | x |
| Plainville Water Co.           | Bristol       | 45                     |                                     |   |
|                                | Plainville    | 16351                  |                                     |   |
|                                | Southington   | 458                    |                                     | x |
| Southbury Training School      | Southbury     | 2450                   |                                     | x |
| Southington Water Works Dept.  | Cheshire      | 248                    |                                     |   |
|                                | Southington   | 34568                  | x                                   | x |
| Terryville Div. CT Water Co.   | Plymouth      | 5642                   | x                                   | x |
| Thomaston Div. CT Water Co.    | Thomaston     | 2831                   | x                                   | x |
| Torrington Water Co. Main Sys. | Torrington    | -                      | x                                   |   |
| Unionville Water Co.           | Avon          | 956                    |                                     |   |
|                                | Farmington    | 5320                   |                                     | x |
| Waterbury Water Bureau         | Waterbury     | 103300                 | x                                   |   |
| Watertown Fire Dist.           | Watertown     | 6600                   | x                                   | x |
| Western Sec., No. Div. CT WC   | E. Windsor    | 2849                   |                                     |   |
|                                | Enfield       | 21686                  |                                     |   |
|                                | S. Windsor    | 6591                   |                                     |   |
|                                | Suffield      | 5317                   |                                     |   |
|                                | Vernon        | 171                    |                                     |   |
|                                | Windsor Locks | 12365                  |                                     | x |
| Woodbury Water Co.             | Woodbury      | 1700                   |                                     | x |

<sup>1</sup> Information taken from Housatonic River Basin Urban study, U.S. Army Corps of E Department of Environmental Protection, Natural Resources Center.



E 1 (Continued)  
WESTERN AND NORTHWESTERN CONNECTICUT

| Supply<br>Fund | Water Production<br>1980 - MG |                    | Est. Safe Yield<br>MGD |                                  | Water<br>Purchased<br>MG |
|----------------|-------------------------------|--------------------|------------------------|----------------------------------|--------------------------|
|                | Surface                       | Ground             | Surface                | Ground<br>(Active)<br>(Inactive) |                          |
|                | 1163.8                        | 49.5               | 4.770 <sup>1</sup>     | -                                |                          |
|                | 4040.0                        |                    | 8.000                  |                                  | 64.2                     |
|                | 132.4                         | 206.6              | .964 <sup>1</sup>      | .810                             |                          |
|                |                               | 118.6 <sup>1</sup> |                        | .540                             |                          |
|                |                               | 905.7              |                        | 2.948                            | 75.2                     |
|                |                               | 118.6 <sup>1</sup> |                        | .658                             |                          |
|                | 278.7                         | 995.6              | -                      | 1.836                            | 1.593                    |
|                | 5.9                           | 155.6              | -                      | .740                             |                          |
|                | 110.1                         | 71.8               | .400                   | .110                             | 47.6                     |
|                | 1589.7                        |                    | 4.720 <sup>1</sup>     |                                  |                          |
|                |                               | 185.9              | -                      | -                                | .648                     |
|                | 7823.0                        |                    | 70.500                 |                                  | 47.3                     |
|                | 0                             | 301.5              | 1.390                  | 12.800                           | 1.5                      |
|                |                               | 1361.7             |                        | .385                             | 374.8                    |
|                |                               | 59.6               |                        | .108                             | .162                     |

of Engineers, September 1982. All other information provided by the State of Connecticut,

TABLE 2  
POPULATION PROJECTIONS

| Hartford County | Census  |         |         |         | % Change |
|-----------------|---------|---------|---------|---------|----------|
|                 | 1980    | 1985    | 1990    | 1995    | 2000     |
| Avon            | 11,201  | 12,200  | 13,200  | 13,700  | 14,200   |
| Berlin          | 15,121  | 15,520  | 15,920  | 15,970  | 15,840   |
| Bloomfield      | 18,608  | 19,510  | 20,310  | 21,110  | 22,110   |
| Bristol         | 57,370  | 58,870  | 59,970  | 60,770  | 61,470   |
| Burlington      | 5,660   | 5,970   | 6,230   | 6,430   | 6,540    |
| Canton          | 7,635   | 7,970   | 8,320   | 8,530   | 8,650    |
| East Granby     | 4,102   | 4,300   | 4,540   | 4,730   | 4,870    |
| Farmington      | 16,407  | 16,710  | 17,010  | 17,110  | 17,610   |
| Granby          | 7,956   | 8,360   | 8,860   | 9,260   | 9,760    |
| Hartford        | 136,392 | 136,390 | 138,390 | 140,890 | 143,390  |
| Hartland        | 1,416   | 1,460   | 1,530   | 1,610   | 1,670    |
| New Britain     | 73,840  | 73,940  | 73,380  | 72,270  | 70,810   |
| Newington       | 28,841  | 29,640  | 30,640  | 31,640  | 32,140   |
| Plainville      | 16,401  | 16,900  | 17,370  | 17,570  | 17,500   |
| Rocky Hill      | 14,559  | 16,560  | 18,560  | 20,060  | 21,560   |
| Simsbury        | 21,161  | 22,160  | 23,360  | 24,660  | 26,160   |
| Southington     | 36,879  | 37,880  | 39,380  | 40,580  | 41,580   |
| Suffield        | 9,294   | 9,550   | 9,740   | 9,890   | 9,860    |
| West Hartford   | 61,301  | 61,210  | 61,290  | 60,910  | 60,070   |
| Wethersfield    | 26,013  | 26,310  | 26,510  | 26,810  | 27,010   |
| Windsor         | 25,204  | 26,400  | 27,500  | 28,700  | 29,700   |
| Windsor Locks   | 12,190  | 12,420  | 12,620  | 12,620  | 12,320   |
| TOTALS          | 607,551 | 620,230 | 634,630 | 645,820 | 654,820  |
|                 |         |         |         |         | 7.8      |

TABLE 2 (Continued)  
POPULATION PROJECTIONS

| Litchfield County | Census  |         |         |         |         | % Change |
|-------------------|---------|---------|---------|---------|---------|----------|
|                   | 1980    | 1985    | 1990    | 1995    | 2000    |          |
| Barkhamsted       | 2,935   | 3,050   | 3,230   | 3,390   | 3,490   | 18.9     |
| Bethlehem         | 2,573   | 2,710   | 2,850   | 2,980   | 3,120   | 21.3     |
| Bridgewater       | 1,563   | 1,610   | 1,690   | 1,730   | 1,810   | 15.8     |
| Canaan            | 1,002   | 1,020   | 1,030   | 1,040   | 1,050   | 4.8      |
| Colebrook         | 1,221   | 1,250   | 1,280   | 1,310   | 1,350   | 10.6     |
| Cornwall          | 1,288   | 1,300   | 1,310   | 1,320   | 1,330   | 3.3      |
| Goshen            | 1,706   | 1,860   | 1,960   | 2,090   | 2,210   | 29.5     |
| Harwinton         | 4,889   | 5,170   | 5,470   | 5,730   | 5,920   | 21.1     |
| Kent              | 2,505   | 2,630   | 2,760   | 2,880   | 2,960   | 18.2     |
| Litchfield        | 7,605   | 7,830   | 8,010   | 7,990   | 8,040   | 5.7      |
| Morris            | 1,899   | 1,930   | 1,960   | 2,000   | 2,000   | 5.3      |
| New Hartford      | 4,884   | 5,070   | 5,240   | 5,320   | 5,350   | 9.5      |
| New Milford       | 19,420  | 20,420  | 21,120  | 22,020  | 23,120  | 19.1     |
| Norfolk           | 2,156   | 2,160   | 2,170   | 2,200   | 2,230   | 3.4      |
| North Canaan      | 3,185   | 3,210   | 3,220   | 3,230   | 3,240   | 1.7      |
| Plymouth          | 10,732  | 11,080  | 11,380  | 11,600  | 11,730  | 9.3      |
| Roxbury           | 1,468   | 1,590   | 1,720   | 1,840   | 1,970   | 34.2     |
| Salisbury         | 3,896   | 3,930   | 3,980   | 4,010   | 4,040   | 3.7      |
| Sharon            | 2,623   | 2,640   | 2,670   | 2,690   | 2,720   | 3.7      |
| Thomaston         | 6,276   | 6,390   | 6,570   | 6,730   | 6,780   | 8.0      |
| Torrington        | 30,987  | 31,290  | 31,490  | 31,790  | 31,990  | 3.2      |
| Warren            | 1,027   | 1,050   | 1,090   | 1,110   | 1,120   | 9.1      |
| Washington        | 3,657   | 3,710   | 3,760   | 3,810   | 3,860   | 5.6      |
| Watertown         | 19,489  | 19,790  | 20,090  | 20,390  | 20,690  | 6.2      |
| Winchester        | 10,841  | 10,790  | 10,960  | 11,090  | 11,170  | 3.0      |
| Woodbury          | 6,942   | 7,110   | 7,220   | 7,280   | 7,260   | 4.6      |
| TOTALS            | 156,769 | 160,590 | 164,230 | 167,570 | 170,550 | 8.8      |

TABLE 2 (Cont inued)  
POPULATION PROJECTIONS

| Census                  |  | 1980    | 1985    | 1990    | 1995    | 2000    | % Change |
|-------------------------|--|---------|---------|---------|---------|---------|----------|
| <u>Middlesex County</u> |  |         |         |         |         |         |          |
| Cromwell                |  | 10,265  | 10,870  | 11,570  | 12,170  | 12,770  | 24.4     |
| Middlefield             |  | 3,796   | 4,000   | 4,200   | 4,340   | 4,320   | 13.8     |
| Middletown              |  | 39,040  | 40,440  | 41,740  | 43,140  | 44,540  | 14.1     |
| TOTALS                  |  | 53,101  | 55,310  | 57,510  | 59,650  | 61,630  | 16.1     |
| <u>New Haven County</u> |  |         |         |         |         |         |          |
| Beacon Falls            |  | 3,995   | 4,150   | 4,250   | 4,350   | 4,400   | 10.1     |
| Cheshire                |  | 21,788  | 23,290  | 24,790  | 25,790  | 26,790  | 23.0     |
| Meriden                 |  | 57,118  | 57,670  | 58,020  | 58,120  | 58,870  | 3.1      |
| Middlebury              |  | 5,995   | 6,080   | 6,200   | 6,310   | 6,380   | 6.4      |
| Naugatuck               |  | 26,456  | 27,150  | 28,040  | 28,900  | 29,640  | 12.0     |
| Oxford                  |  | 6,634   | 7,210   | 7,680   | 8,140   | 8,540   | 28.7     |
| Prospect                |  | 6,807   | 6,790   | 6,810   | 6,760   | 6,630   | -2.5     |
| Southbury               |  | 14,156  | 15,060  | 15,760  | 16,460  | 17,260  | 21.9     |
| Waterbury               |  | 103,266 | 102,760 | 103,660 | 104,530 | 105,410 | 2.1      |
| Walcott                 |  | 13,008  | 13,220  | 13,650  | 13,940  | 13,990  | 7.5      |
| TOTALS                  |  | 259,223 | 263,380 | 268,815 | 273,300 | 277,910 | 7.2      |

storage serving authorized purposes to storage serving municipal or industrial water supply within the Corps discretionary authority.

In addition, guidance contained in ER 1110-2-1941 directs field offices to determine the short term water supply capability of existing Corps reservoirs that would be functional under existing authorities.

b. Drought Contingency Storage. It has been estimated that a small amount of the existing storage at Black Rock Lake can be put to multiple use for drought contingency as well as flood control. This infringement would result in a maximum pool elevation of about 444 feet NGVD (34-foot stage), representing a total volume of about 500 acre-feet, or about 197 acre-feet over the permanent pool storage level. The total volume of 500 acre-feet (163 million gallons) constitutes about 6 percent of the total reservoir storage. It was concluded that this was the maximum infringement for drought purposes without seriously inundating two reservoir roads. Additionally, further infringement may kill timber and vegetation in the uncleared reservoir areas impacting water quality and aesthetics.

The top of the stoplog structure is at elevation 437 feet NGVD; therefore, higher pool levels would be maintained by regulation of the flood control gates. Since inflow to the reservoir can fluctuate within short periods of time, monitoring of the pool level would be required on at least a daily basis.

Based on an all-season low flow duration analysis for Branch Brook at Black Rock Lake using estimating methods developed by the US Geological Survey, it was determined that during a 10-year frequency drought there would be sufficient riverflow either to maintain a water supply yield of about 1 cfs (0.7 mgd) or to fill the reservoir from elevations 437 to 444 feet (197 acre-feet) in an 86-day period, provided no releases were made downstream. Based on the low flow analysis, it was determined that a flow of about 2 cfs from the upstream watershed would not be available for approximately 120 days. Once a flow of 2 cfs (0.1 cfs/square mile) was reached and maintained then either a water supply yield of 0.6 cfs (0.4 mgd) could be maintained or the project could be filled to the 444 foot NGVD level over a 152-day period. It was

further concluded that in the event of a severe drought emergency, all water in storage could be made available for water supply providing 500 acre-feet (163 million gallons) if the storage were initially at elevation 444 feet NGVD. Water stored could be drawn directly from the reservoir pool or released downstream. Drought contingency storage versus flow duration at Black Rock Lake is shown graphically on plate 3.

## 8. WATER QUALITY EVALUATION

a. Water Quality Classification. Branch Brook within the Black Rock Lake boundaries and downstream to the confluence with the Naugatuck River is designated class B by the Connecticut Department of Environmental Protection. Class B waters are suitable for bathing, recreational uses, agricultural uses, and industrial processes including cooling and providing excellent fish and wildlife habitat. Public water supply after treatment is not one of the uses given in Connecticut Water Quality Standards for class B waters. However, a water which meets class B standards could be made potable with standard treatment processes. In addition, this portion of Branch Brook has also been classified as a cold water fishery including fish spawning and growth. Technical criteria for these waters include dissolved oxygen levels greater than 4 mg/l, turbidity levels less than 10 JTU, fecal coliform levels less than 200/100 ml, pH in the range from 6.5 to 8.0, and no chemical constituents in concentrations or combinations which would be harmful to human, animal or aquatic life.

b. Existing Water Quality. There are few residences and no point source discharges in the Black Rock Lake watershed. Black Rock Lake has high quality water which generally meets or exceeds Connecticut class B standards. The principal water quality concern is the frequent occurrence of low pH levels caused, most likely, by acid precipitation on poorly buffered New England soils and the natural effects of upstream swamps and marshes. High coliform levels have been measured in the past, but no recent data are available to determine if a problem exists. Given the undeveloped nature of the watershed, it is unlikely that high coliform levels would be a problem. Other lesser concerns include high color levels and rare low DO levels. Turbidity, nutrients, and metals levels are low and are not problems.

c. Stratification Patterns. Lake profile data have not been collected at Black Rock Lake; however, its stratification patterns can be inferred from other similar NED projects at which water quality profiles have been measured. Black Rock Lake probably experiences only slight to moderate temperature induced density stratification during the summer. Low DO conditions would be expected in the hypolimnion but anaerobic conditions would be rare and of short duration. Some increases in iron, manganese, and nutrients would occur during periods of anaerobiasis.

d. Water Quality Requirements for Drought Storage. The two requirements on waters to be met are the State standards for surface waters and quality suitable for domestic or industrial water supply use. Class B waters are not designated for use as public water supply. However, a water which meets class B standards would not likely require excessive treatment costs to improve it to a level such that it could be used for public water supply. The water quality required for industrial water supply depends on the specific industrial process involved.

e. Effects of Drought Storage. The impact of increasing the pool at Black Rock Lake on water quality will be minor. The principal changes that could occur would be an increase in the temperature of the lake and discharge from the lake. Other possible changes include increases in metals and nutrients levels in the lake.

Increasing the size of the permanent pool at Black Rock Lake will increase the hydraulic detention time in the lake. This will cause a warming of the lake waters and increases in the frequency, duration, and strength of the anaerobic layer in the hypolimnion. Because nutrients and metals, particularly iron and manganese, can be released from sediments under anaerobic conditions, an increase in anaerobiasis would be expected to increase levels of these parameters. A positive effect of increasing the hydraulic detention time would be a reduction in turbidity and coliform levels through settling and natural die-off. All these changes are expected to be small.

f. Conclusions. Raising the pool at Black Rock Lake to elevation 444 feet NGVD as proposed most likely will cause no more than minor water quality problems. The stored water will be of a basically

good quality that will meet class B standards and be usable for public water supply after treatment and for all other uses.

## 9. DISCUSSIONS OF IMPACTS

a. General. Any action resulting in a temporary change of reservoir storage volume will have impacts on other project purposes which must be evaluated before a storage reallocation plan can be implemented. At Black Rock Lake, an evaluation has been made of the impacts resulting from drought contingency storage on the flood control purpose of this project. Effects on recreation, sedimentation and the aquatic and terrestrial environments as well as the historic and archeological resources have also been addressed.

b. Flood Control. A review of the regulation procedures at Black Rock Lake was undertaken to determine the volume of water that could be made available for drought contingency purposes. The water would be stored by temporarily utilizing existing flood control storage. It is recognized that major floods occur in every season of the year, and any use of flood control storage would be continually monitored to insure there would be no adverse impacts on downstream flood protection.

The maximum pool elevation at Black Rock Lake for drought contingency storage has been estimated to be elevation 444 feet, representing an infringement on the flood control storage of about 0.2 inch of runoff from the upstream 20.4-square mile drainage area.

c. Recreation. The State of Connecticut is presently installing a beach on State-owned land at elevation 437 feet NGVD, to act as a substitute for another nearby State facility which is closed for repair. This facility will be used for the next several years. Both the beach and the access road would be inundated at elevation 444.

d. Sedimentation. Some slumping, erosion and turbidity can be expected with the proposed increased pool levels.

e. Project Operation. Maintaining the pool level at elevation 444 feet (34-foot stage) by means of gate regulation will have a significant impact on project personnel in the requirement of daily or more frequent gate adjustments. Users of the proposed



drought storage may be required to bear the expense of the increased labor costs.

The proposed increase in the impoundment may result in a tree kill along the entire shoreline, resulting in a significant impact on cleanup efforts. The added cost of the cleanup may also be an additional cost to the users.

#### 10. POTENTIAL ENVIRONMENTAL IMPACTS

a. Drought Contingency Operation. The proposed plan would involve temporarily increasing the existing 27-foot deep reservoir to a 34-foot pool for potential water supply use during drought conditions. The 10-year frequency low flow would be imposed on the downstream use beginning in May and would last throughout the drought period. Typical hydrological conditions indicate that inflows would not be stored until September when they exceed 2 cfs. At that time, the anticipated rate of pool increase would be about two inches per day over a 47-day period.

b. Effects on the Aquatic Environment. The aquatic environment of the project area consists of Branch Brook, upstream and downstream of the dam and its tributaries and Black Rock Lake. Branch Brook is considered by the State Department of Environmental Protection as a "good" trout brook with good streamside vegetative cover and class "B" waters. The reservoir is stocked with brown, rainbow and brook trout by the State which meets some of the angling demands of the area. The State of Connecticut indicated that the fishery is basically "put and take" with no confirmed records of natural reproduction. The reservoir also provides warm water fish habitat for bullheads, largemouthed bass, sunfish, perch and other species.

An increase in the impoundment due to the proposed contingency storage would temporarily inundate the stream habitat of Branch Brook during the fall and throughout the storage period. This would probably not have more of a significant adverse effect than has occurred with past flood control operations. The increase in storage should not impact the reproduction of most warm water species in the reservoir which generally occurs during spring and early summer. The warm water fishery may in fact benefit from the small amount of nutrients expected to be introduced into the lake.

The downstream impacts also may not be significant. The imposition of the 10-year frequency low flow in a drought year would not appreciably change the flow throughout spring and summer. Significance of the impacts in the fall would depend on whether the downstream area is utilized for spawning by trout.

c. Effects on the Terrestrial Environment. The terrestrial environment at the project consists primarily of forest shrub and open vegetative cover types. The forests are primarily made up of hardwoods such as oak, hickory, beech, birch, maple and aspen and softwoods like hemlock and white pine. Open land which consists of the damsite, old fields and a portion of a borrow area comprise approximately 30 percent of the reservoir. Wildlife that use the habitat may be classified as "farmland" species which are adapted to farm and residential environments and require a good mix of wooded and open land. The reservoir has been cleared to the 437 foot elevation, NGVD.

White tail deer frequent the reservoir lands, moving in from adjacent farms and woodlands. No evidence of deer yarding in winter is present. The State stocks ring-necked pheasants for the fall hunting season.

Black Rock Lake lies enroute to the Atlantic flyway for many migratory waterfowl and hawks. Lack of emergent vegetation for food and cover, and the unpredictable water level in the spring and fall discourage all but occasional use by waterfowl. Lack of wetland areas along the water courses virtually eliminates suitable waterfowl nesting and brooding sites. Some furbearers, mainly muskrat, inhabit the reaches of the brook upstream of the lake; occasional evidence of beaver has been observed. Limiting factors are a lack of a wetland (marsh) habitat and streambank characteristics.

The proposed increase in the impoundment would temporarily inundate about 11 acres of forest and open land habitats near the end of the growing season. Storage would probably kill tree species such as sugar maple, birches, beech, white pine, hemlock and oaks between the 437 and 444 foot elevations. Storage during April and May of this year caused considerable loss of hemlock in the lower impoundment area.

The anticipated loss of vegetation would degrade wildlife habitat for most of the impounded area. Wildlife would be displaced on adjacent land where the habitat would probably not be able to support the added individuals.

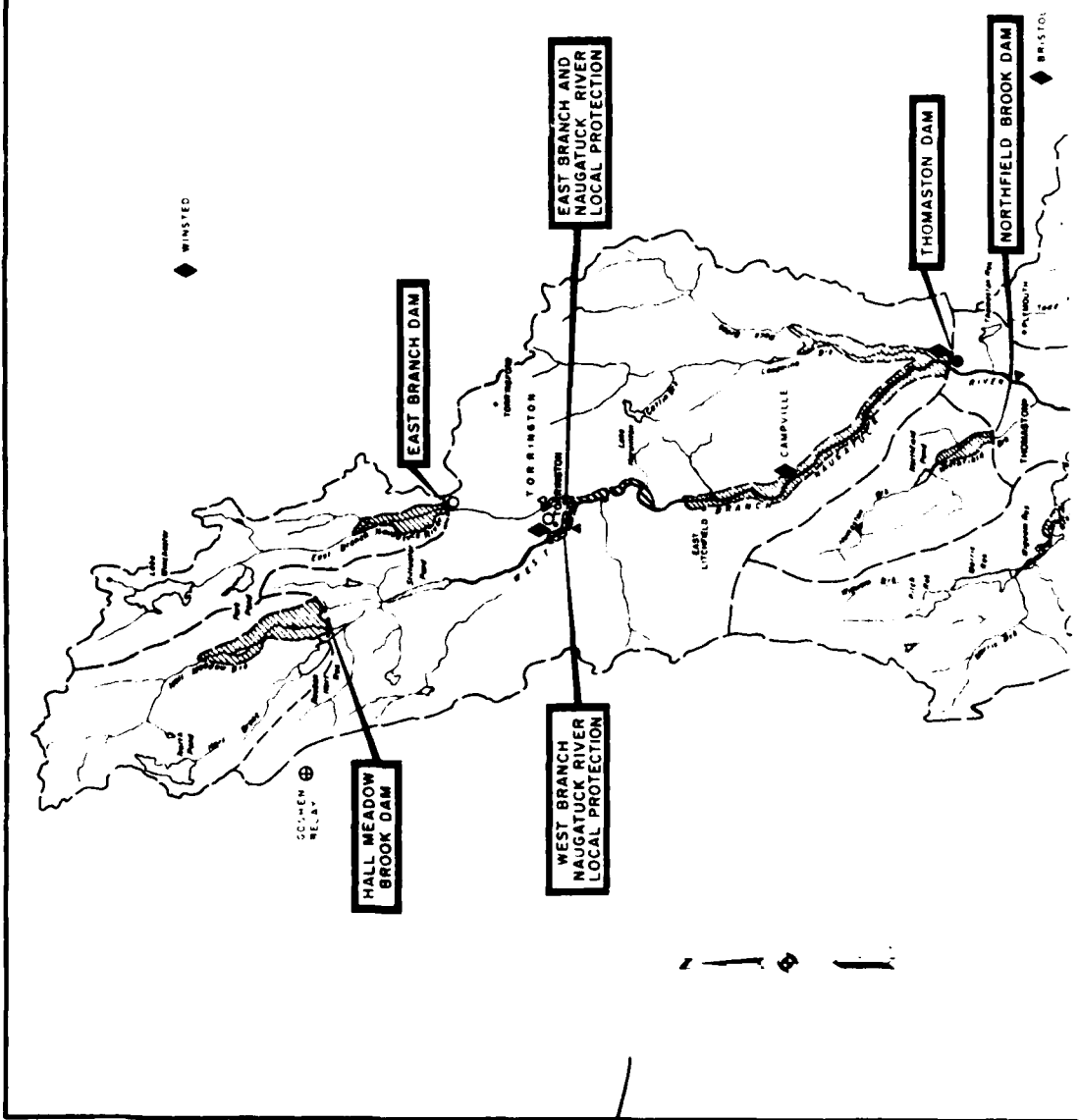
#### 11. HISTORIC AND ARCHEOLOGICAL RESOURCES

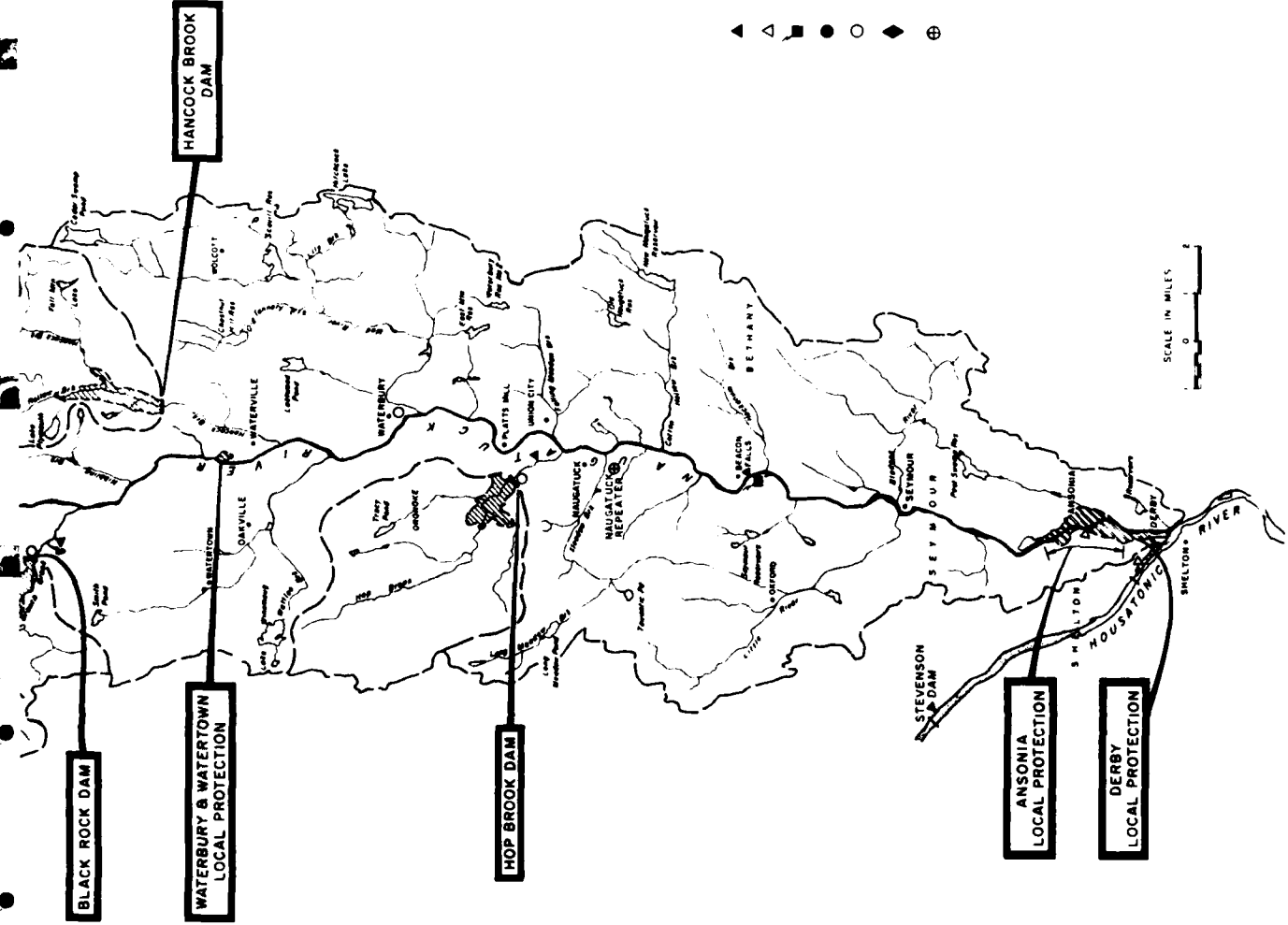
The major potential impact of a drought contingency plan at Black Rock Lake upon historic or archeological sites would be from prolonged inundation of the area below elevation 444. While no structures are recorded as being removed from this area during the time of dam construction, earlier historic and prehistoric sites could exist.

#### 12. SUMMARY AND CONCLUSIONS

A drought contingency plan was studied for Black Rock Lake in an effort to be responsive to public needs during drought situations. A 90 percent chance of dependable water supply yield of about 0.6 cfs ( 0.4 mgd) could be provided while still maintaining a downstream release of about 2 cfs or the project filled to elevation 444 feet NGVD, providing a maximum water supply reserve of about 500 acre-feet (163 million gallons).

An evaluation of the effects of this drought contingency plan on the various project features, as well as on certain environmental aspects, has revealed some impacts. This evaluation was based on preliminary studies utilizing readily available information.

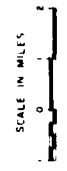




# LEGEND

- ▲ RECORDING GAGE (RIVER)
- △ NON-RECORDING GAGE (RIVER)
- TELEMARK GAGE
- RECORDING GAGE (RAINFALL)
- NON-RECORDING GAGE (RAINFALL)
- ◆ SNOW SURVEY COURSE
- ⊕ AUTOMATIC HYDROLOGIC RADIO REPORTING NETWORK RELAY (CONTAINS RADIO TIED TO BENTLEY TO RCC COMPUTER NETWORK)

WATER RESOURCES DEVELOPMENT PROJECT  
 HOUSATONIC RIVER BASIN  
**NAUGATUCK RIVER WATERSHED MAP**  
 NEW ENGLAND DIVISION WALTHAM, MASS  
 SEPTEMBER 1976



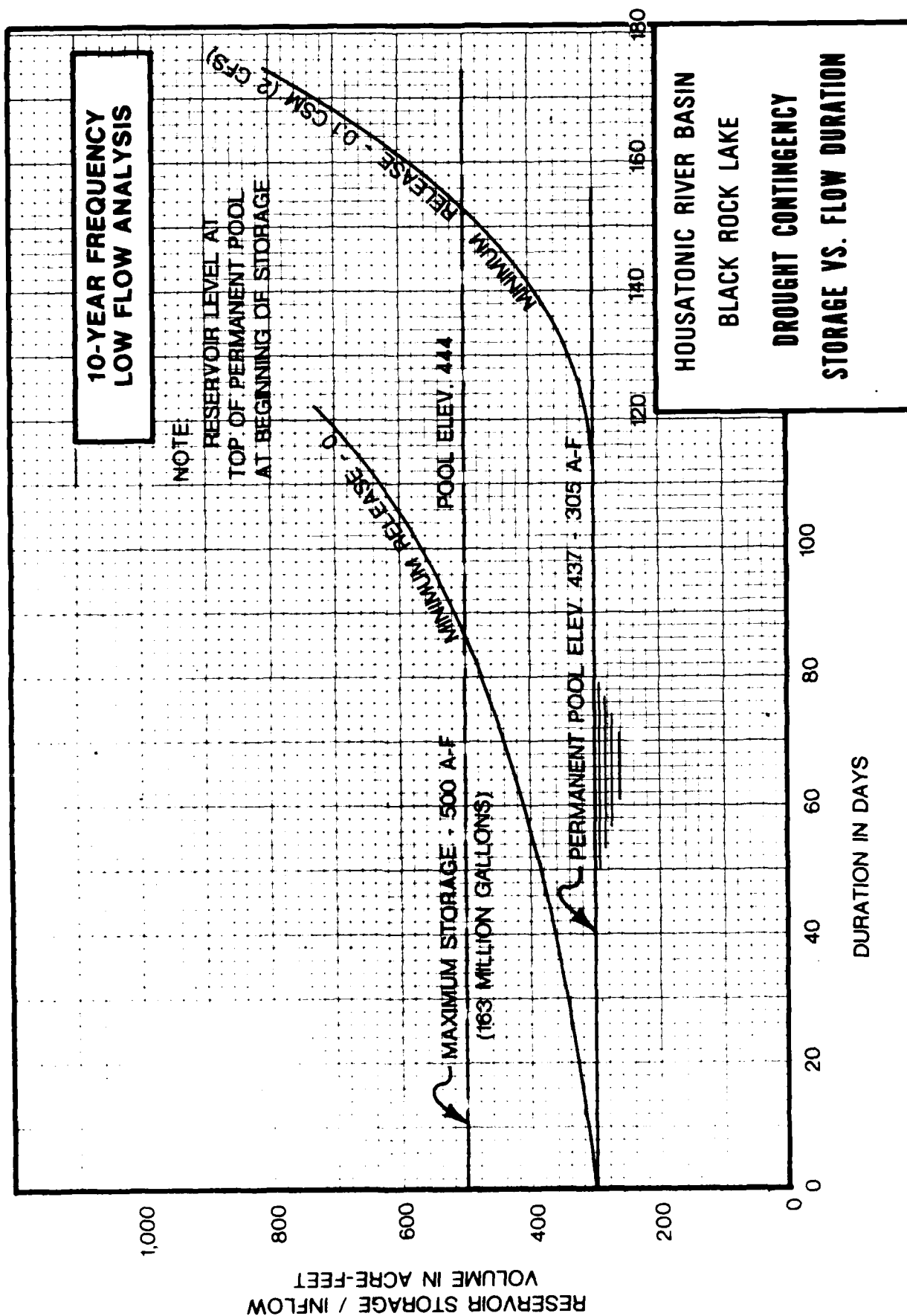
BLACK ROCK LAKE  
AREA-CAPACITY TABLE  
DRAINAGE AREA = 20.4 SQUARE MILES

| Stage<br>(ft) | Elev.<br>(msl) | Area<br>(acres) | Capacity |          | Stage<br>(ft) | Elev.<br>(msl) | Area<br>(acres) | Capacity |          |
|---------------|----------------|-----------------|----------|----------|---------------|----------------|-----------------|----------|----------|
|               |                |                 | (ac/ft)  | (inches) |               |                |                 | (ac/ft)  | (inches) |
| 0             | 410            | 0               | 0        | 0        | 56            | 466            | 74              | 1,311    | 1.20     |
| 2             | 412            | 2               | 2        | 0        | 58            | 468            | 78              | 1,463    | 1.34     |
| 4             | 414            | 4               | 8        | 0.01     | 60            | 470            | 83              | 1,624    | 1.49     |
| 6             | 416            | 6               | 18       | 0.02     | 62            | 472            | 87              | 1,794    | 1.65     |
| 8             | 418            | 7               | 31       | 0.03     | 64            | 474            | 92              | 1,973    | 1.81     |
| 10            | 420            | 8               | 46       | 0.04     | 66            | 476            | 97              | 2,162    | 1.99     |
| 12            | 422            | 10              | 64       | 0.06     | 68            | 478            | 101             | 2,360    | 2.17     |
| 14            | 424            | 12              | 86       | 0.08     | 70            | 480            | 106             | 2,567    | 2.36     |
| 16            | 426            | 14              | 112      | 0.10     | 72            | 482            | 110             | 2,783    | 3.56     |
| 18            | 428            | 16              | 142      | 0.13     | 74            | 484            | 114             | 2,007    | 2.76     |
| 20            | 430            | 17              | 175      | 0.16     | 76            | 486            | 118             | 3,239    | 2.98     |
| 22            | 432            | 18              | 211      | 0.19     | 78            | 488            | 122             | 3,479    | 3.20     |
| 24            | 434            | 19              | 250      | 0.23     | 80            | 490            | 126             | 3,727    | 3.43     |
| 26            | 436            | 20              | 292      | 0.27     | 82            | 492            | 130             | 3,983    | 3.66     |
| 27*           | 437            | 21              | 305      | 0.29     | 84            | 494            | 134             | 4,247    | 3.90     |
| 27            | 437            | 21              | 0        | 0        | 86            | 496            | 138             | 4,519    | 4.15     |
| 28            | 438            | 25              | 24       | 0.02     | 88            | 498            | 143             | 4,800    | 4.41     |
| 30            | 440            | 28              | 77       | 0.07     | 90            | 500            | 147             | 5,090    | 4.68     |
| 32            | 442            | 30              | 135      | 0.13     | 92            | 502            | 151             | 5,388    | 4.95     |
| 34            | 444            | 32              | 197      | 0.18     | 94            | 504            | 156             | 5,695    | 5.23     |
| 36            | 446            | 35              | 264      | 0.24     | 96            | 506            | 160             | 6,011    | 5.52     |
| 38            | 448            | 37              | 336      | 0.31     | 98            | 508            | 163             | 6,334    | 5.82     |
| 40            | 450            | 40              | 413      | 0.38     | 100           | 510            | 168             | 6,665    | 6.13     |
| 42            | 452            | 44              | 497      | 0.46     | 102           | 512            | 172             | 7,005    | 6.44     |
| 44            | 454            | 47              | 588      | 0.54     | 104           | 514            | 176             | 7,353    | 6.76     |
| 46            | 456            | 52              | 687      | 0.63     | 106           | 516            | 180             | 7,709    | 7.09     |
| 48            | 458            | 56              | 795      | 0.73     | 108           | 518            | 185             | 8,074    | 7.42     |
| 50            | 460            | 60              | 911      | 0.84     | 110           | 520            | 190             | 8,450    | 7.80     |
| 52            | 462            | 64              | 1,035    | 0.95     |               |                |                 |          |          |
| 54            | 464            | 69              | 1,168    | 1.07     |               |                |                 |          |          |

(Spillway Crest)

\*Recreation Pool

PLATE 2



END

RECEIVED



